CLAIMS

1. A current injection-type magnetic domain wall-motion device comprising a microjunction structure including a first magnetic body, a second magnetic body with a magnetization direction antiparallel to that of the first magnetic body, and a third magnetic body sandwiched therebetween, wherein the magnetization direction of the device is controlled in such a manner that a current is applied across microjunction interfaces present in the microjunction structure such that a magnetic domain wall is moved by the interaction between the magnetic domain wall and the current in the same direction as that of the current or in the direction opposite to that of the current.

2. The current injection-type magnetic domain wall-motion device according to Claim 1, wherein the magnetic bodies are made of a magnetic semiconductor.

3. The current injection-type magnetic domain wall-motion device according to Claim 2, wherein the magnetic semiconductor is a (Ga, Mn)As ferromagnetic semiconductor.

4. The current injection-type magnetic domain wall-motion device according to Claim 2, wherein the magnetic semiconductor is an (In, Mn)As ferromagnetic semiconductor.

5. The current injection-type magnetic domain wall-motion device according to any one of Claims 1 to 4, wherein the current is a pulse current.

6. The current injection-type magnetic domain wall-motion device according to Claim 5, wherein the pulse current has a current density of 10^4-10^7 A/cm^2.

7. The current injection-type magnetic domain wall-motion device according to Claim 1, wherein the first magnetic body and the second magnetic body with a magnetization direction antiparallel to that of the first magnetic body are prepared by film formation in a magnetic field.

8. The current injection-type magnetic domain wall-motion device according to Claim 1, wherein the magnetization directions of the first and second magnetic bodies are aligned antiparallel to each other with an external magnetic field using a difference in coercive force therebetween after the film formation.

9. The current injection-type magnetic domain wall-motion device according to Claim 8, wherein the first and second magnetic bodies are made of different materials.

10. The current injection-type magnetic domain wall-motion device according to Claim 1, wherein the first and second magnetic bodies are made of the same material and the second magnetic body is magnetically coupled with an antiferromagnetic film disposed on the second magnetic body such that the first and second magnetic bodies have different coercive forces.

11. The current injection-type magnetic domain wall-

motion device according to Claim 1, wherein the first and second magnetic bodies are made of the same material, and have different film thicknesses, such that the first and second magnetic bodies have different coercive forces.

12. The current injection-type magnetic domain wall-motion device according to Claim 1, wherein the first and second magnetic bodies are made of the same material, and have different shapes, such that the first and second magnetic bodies have different coercive forces due to difference of shape anisotropy.

13. The current injection-type magnetic domain wall-motion device according to Claim 2, 3, or 4, wherein different external electric fields are applied to the first and second magnetic bodies made of magnetic semiconductor, such that the first and second magnetic bodies have different coercive forces.

14. The current injection-type magnetic domain wall-motion device according to Claim 1, wherein the third magnetic body has a reduced cross-sectional area such that a magnetic domain wall is encouraged to position at a junction interface between the first and third magnetic bodies or between the second and third magnetic bodies, the magnetic domain wall being present between the first and second magnetic bodies because of the antiparallel magnetization directions of the first and second magnetic bodies, whereby

the energy loss due to the creation of the magnetic domain wall in the third magnetic body is less than both that in the first magnetic body and that in the second magnetic body.

15. The current injection-type magnetic domain wall-motion device according to Claim 1, wherein the third magnetic body is made of a material with a magnetization smaller than that of a material for forming the first and second magnetic body such that a magnetic domain wall is encouraged to position at a junction interface between the first and third magnetic bodies or between the second and third magnetic bodies, the magnetic domain wall being present between the first and second magnetic bodies because of the antiparallel magnetization directions of the first and second magnetic bodies, whereby the energy loss due to the creation of the magnetic domain wall in the third magnetic body is less than both that in the first magnetic body and that in the second magnetic body.

16. The current injection-type magnetic domain wall-motion device according to Claim 1, wherein the first to third magnetic bodies are made of the same material and the magnetization of the third magnetic body is rendered smaller than both that of the first magnetic body and that of the second magnetic body by applying an external electric field to the third magnetic body such that a magnetic domain wall is encouraged to position at a junction interface between

the first and third magnetic bodies or between the second and third magnetic bodies, the magnetic domain wall being present between the first and second magnetic bodies because of the antiparallel magnetization directions of the first and second magnetic bodies, whereby the energy loss due to the creation of the magnetic domain wall in the third magnetic body is less than both that in the first magnetic body and that in the second magnetic body.

17. The current injection-type magnetic domain wall-motion device according to Claim 1, wherein the first and third magnetic bodies have a constriction at a junction interface therebetween and the second and third magnetic bodies have a constriction at a junction interface therebetween such that a magnetic domain wall is encouraged to be trapped at one of the constrictions and is therefore encouraged to be positioned at a junction between the first and third magnetic bodies or between the second and third magnetic bodies, the magnetic domain wall being present between the first and second magnetic bodies because of the antiparallel magnetization directions of the first and second magnetic bodies.

18. The current injection-type magnetic domain wall-motion device according to Claim 1, wherein the magnetization direction of the device can be read out.

19. The current injection-type magnetic domain wall-

motion device according to Claim 18, wherein the magnetization state of the third magnetic body is read out in such a manner that the resistance of the element is measured by applying a small current that is insufficient to move the magnetic domain wall, to a current injection terminal using a feature that the device has different resistances depending whether the magnetic domain wall is located at an interface between the first and third magnetic bodies or located at an interface between the second and third magnetic bodies.

20. The current injection-type magnetic domain wall-moving device according to Claim 19, wherein the junction between the first and third magnetic bodies and the junction between the second and third magnetic bodies are formed to have asymmetric structure such that a difference in resistance is readily created in the device.